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# SCAN DR SYSTEM

2010



*JSB Medics Co., Ltd.*



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# Contents

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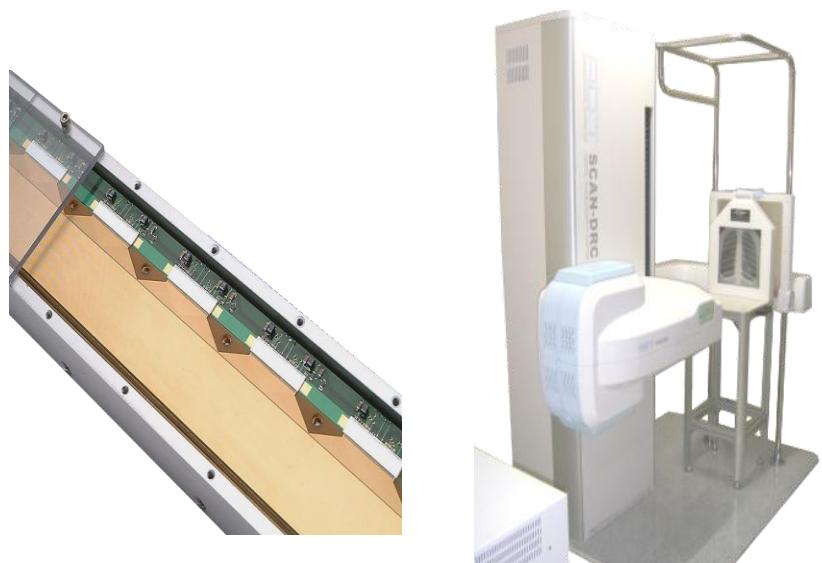
- I. Business Approach to Digital Radiography
- II. Digital Radiography System
- III. The concept of JSB Scan-DR System
- IV. Advantages of JSB Scan DR
- V. Comparison of working efficiency
- VI. JSB's Detector and Products
- VII. Comparison of Digital X-Ray System
- VIII. Marketing Survey
- IX. Misunderstanding about Scan type



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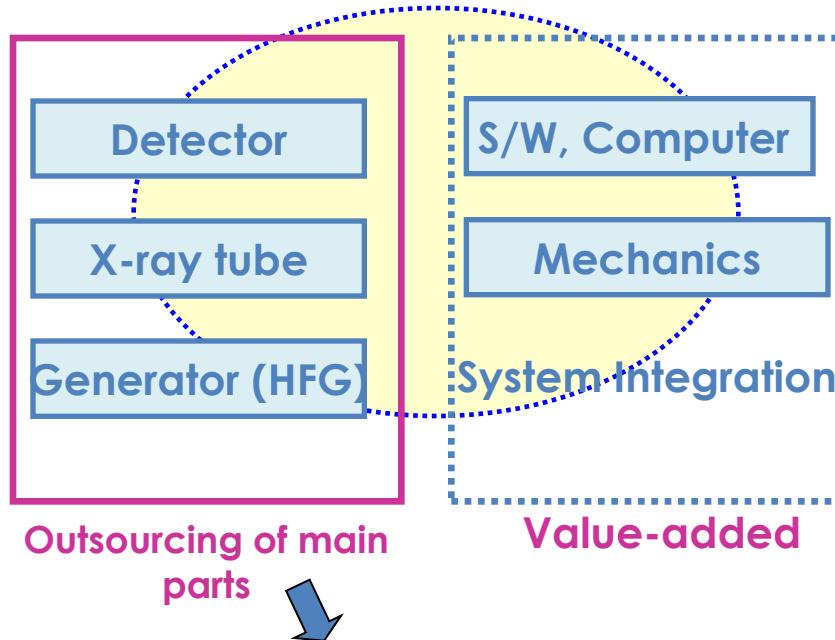
### Development of Detector and X-ray System

- Research for high performance detector
- Application study for efficient radiography system
- Low dose radiography
- Design for mechanics of radiography system
- Development of medical image Software
- Development of X-ray image acquisition system
- Imaging processing software based on DICOM

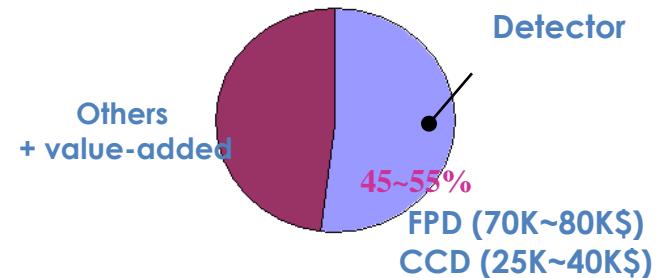


# I. Business Approach to Digital Radiography

## Composition of DR System



Manufacturing cost of DR



Pre-occupied by major companies → Severe competition & low profits

## Conclusion of JSB

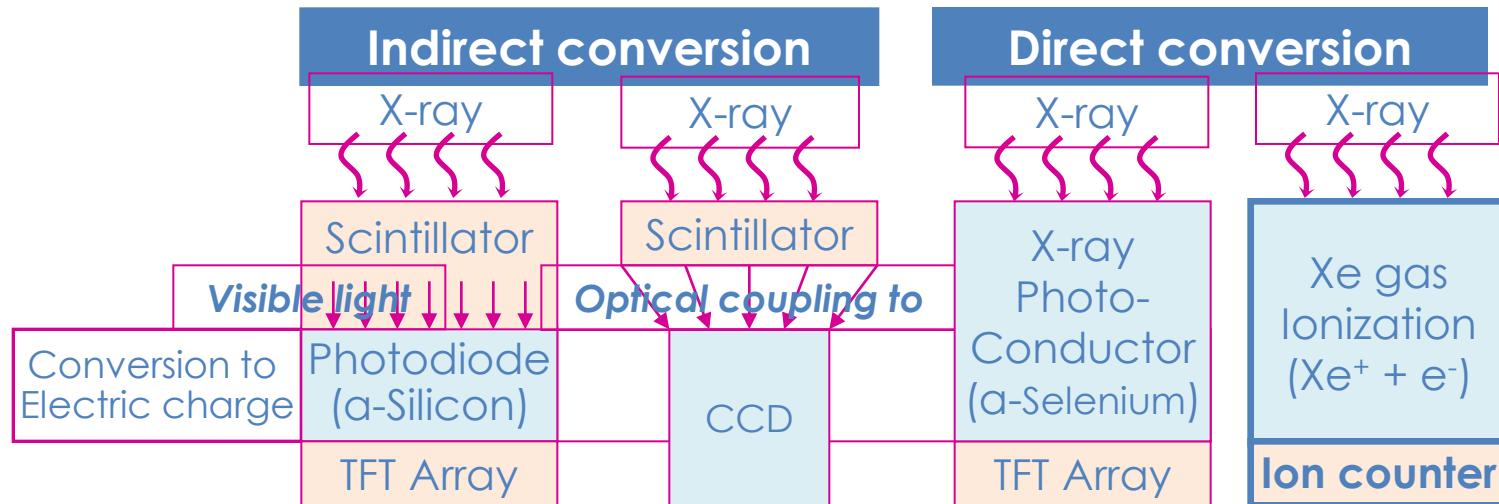
How we can penetrate the market ? → Scan type with our own detector

## II. Digital Radiography (DR)

### 1. Category



### 2. Conversion principle



## II. Digital Radiography (DR)

### CCD DR



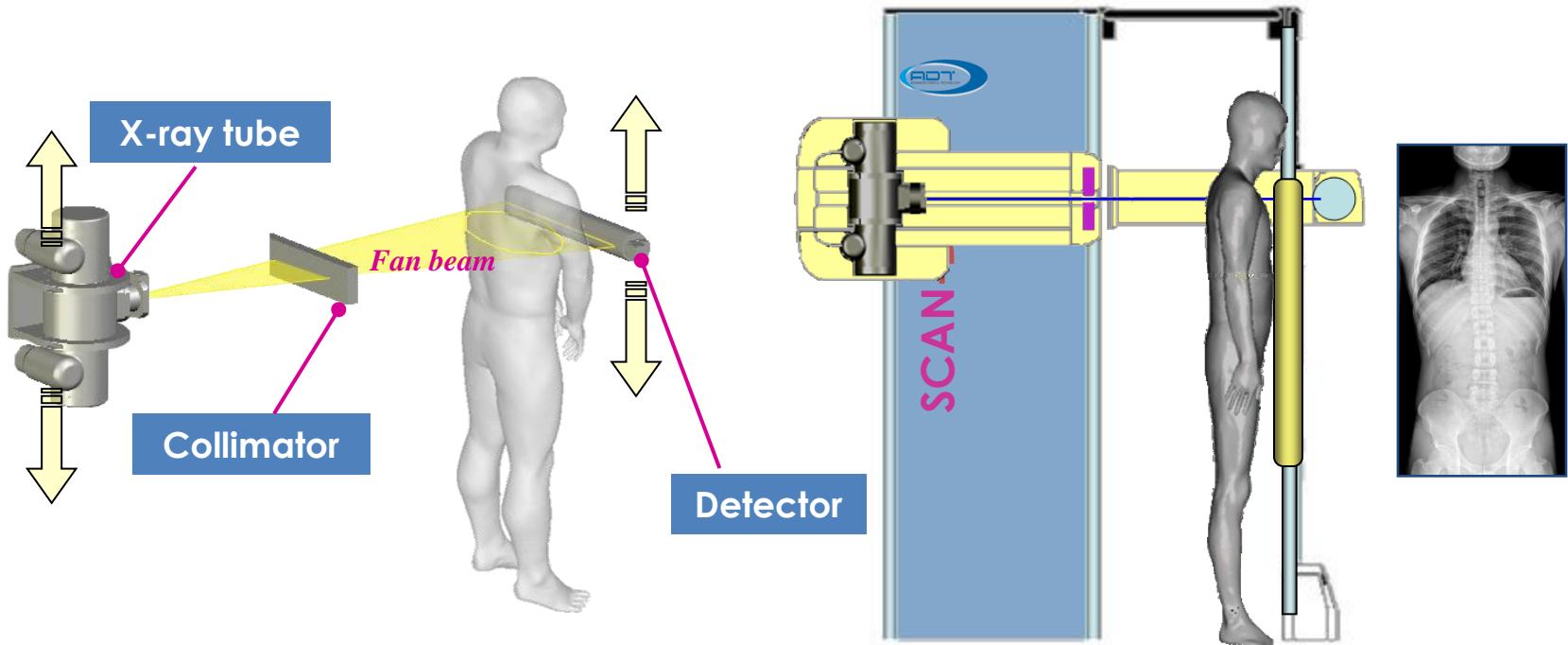
### FPD(Flat Panel Detector)

Indirect (scintillator + a-Si : TFT )/ Direct conversion ( a-Se:TFT)



# III. The Concept of JSB's Scan DR System

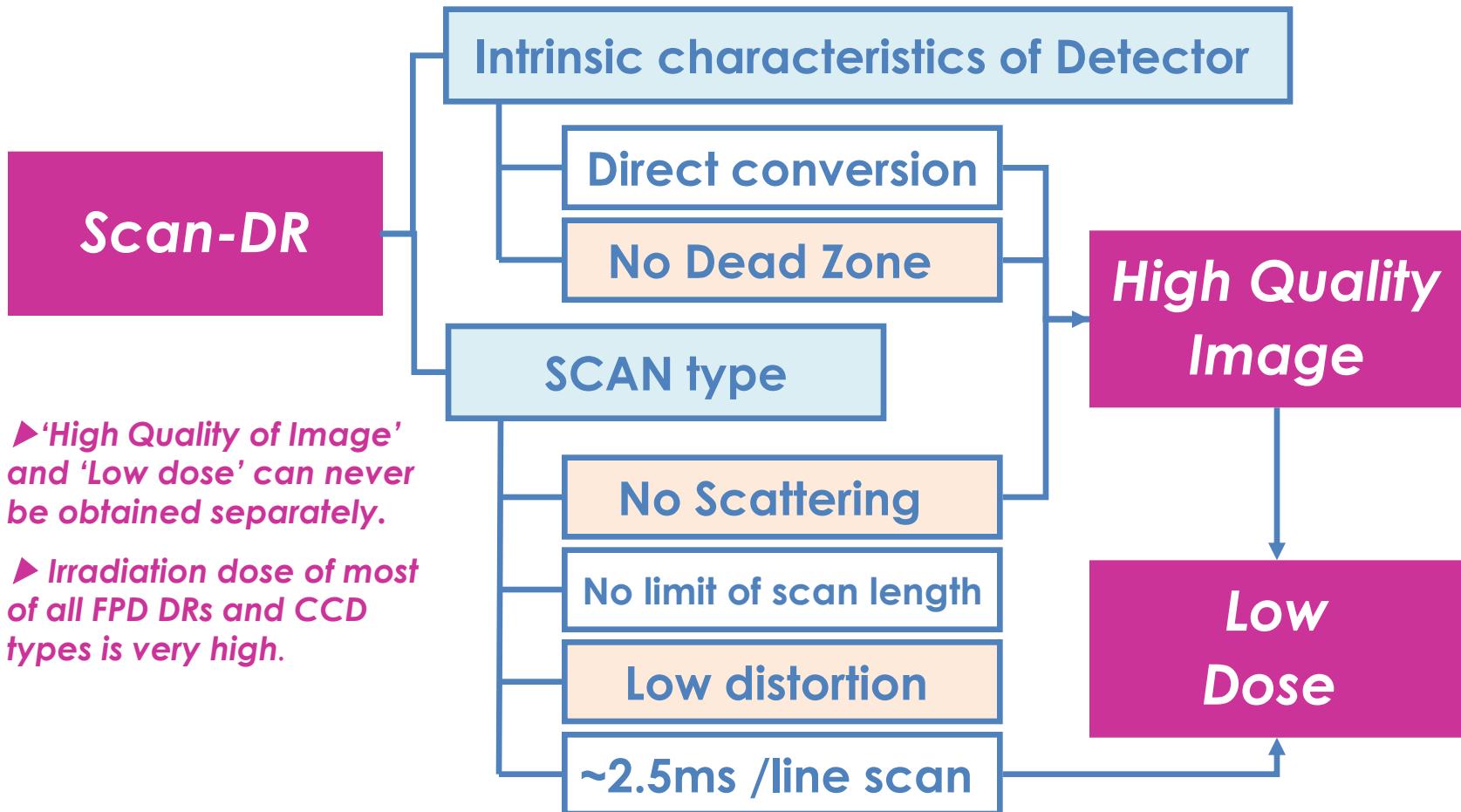
## 1. Operation of Scan DR



Digital radiography image is taken through a linear detector which is moving with fan beam formed by the collimator

### III. The Concept of JSB's Scan DR System

#### 2. Characteristics of Scan DR



## IV. Advantages of JSB Scan DR

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### 1. Economical installation and operation

- ▶ Installation cost : < 1/3 of FPD
- ▶ Long life time with consistent image quality
  - ▷ Warranty of detector : 1 years
  - cf.) Life time of FPD : 2~3 years
- ▶ No aging effect of detector such as dead pixels and decrease of sensitivity
- ▶ Strong structure against harsh operating environment such as tough handling, vibration and temperature
- ▶ Low maintenance cost : low price of detector



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## IV. Advantages of JSB Scan DR

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### 2. Low Radiation dose

- ▶ radiation dose / chest : < 1/3 of others
- ▶ safe to children and pregnant women
- ▶ negligible dose to operator

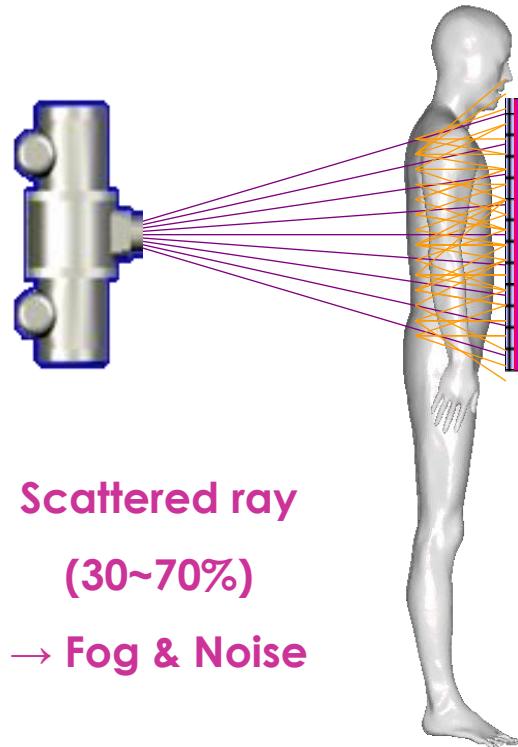
#### Why ?

- ▷ Scattered radiation is very low due to usage of fan beam → no need of grid → low exposure energy
- ▷ Exposure time is very short
  - ex )  $\text{exposure time} = \text{thickness of fan beam} / \text{scan speed}$   
 $= 0.8\text{mm} / 200\text{mm/sec.} = 1 / 250 \text{ sec.}$
  - cf. ) other radiography system :  $1/20 \sim 1/5 \text{ sec.}$

# IV. Advantages of JSB Scan DR

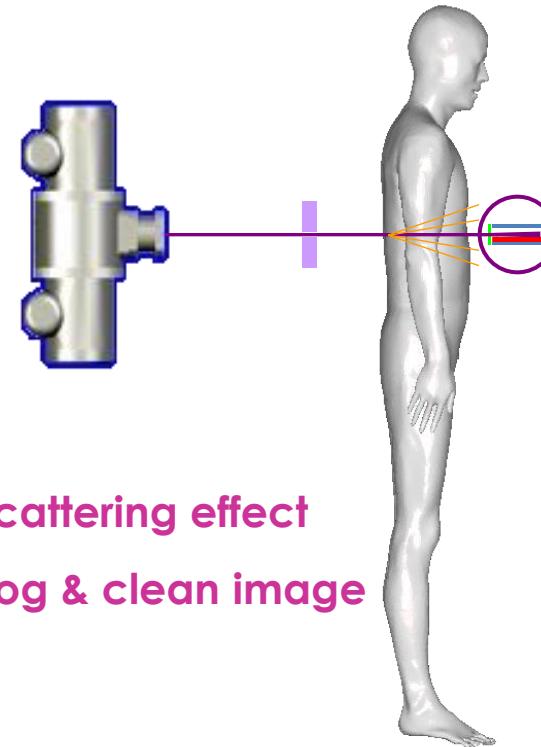
## ► Scattered radiation

Flat Panel Detector/ Film



Scattered ray  
(30~70%)  
→ Fog & Noise

JSB Detector



No scattering effect  
→ No fog & clean image

## IV. Advantages of JSB Scan DR

### 3. Long image size with single exposure

- ▶ Image size : 16" × ~ 39" (410 × ~ 990mm)
  - 2048 × 5710 pixels
- ▶ enable to get whole spine or long bone image within 10 sec. including image processing
- ▶ Real size of spine or bone at the direction of scan

►► **Very convenient and high working efficiency for chiropractic and orthopedic application**



# V. Comparison of working efficiency

Clinical evidence

## Comparison to CR with respect to working efficiency

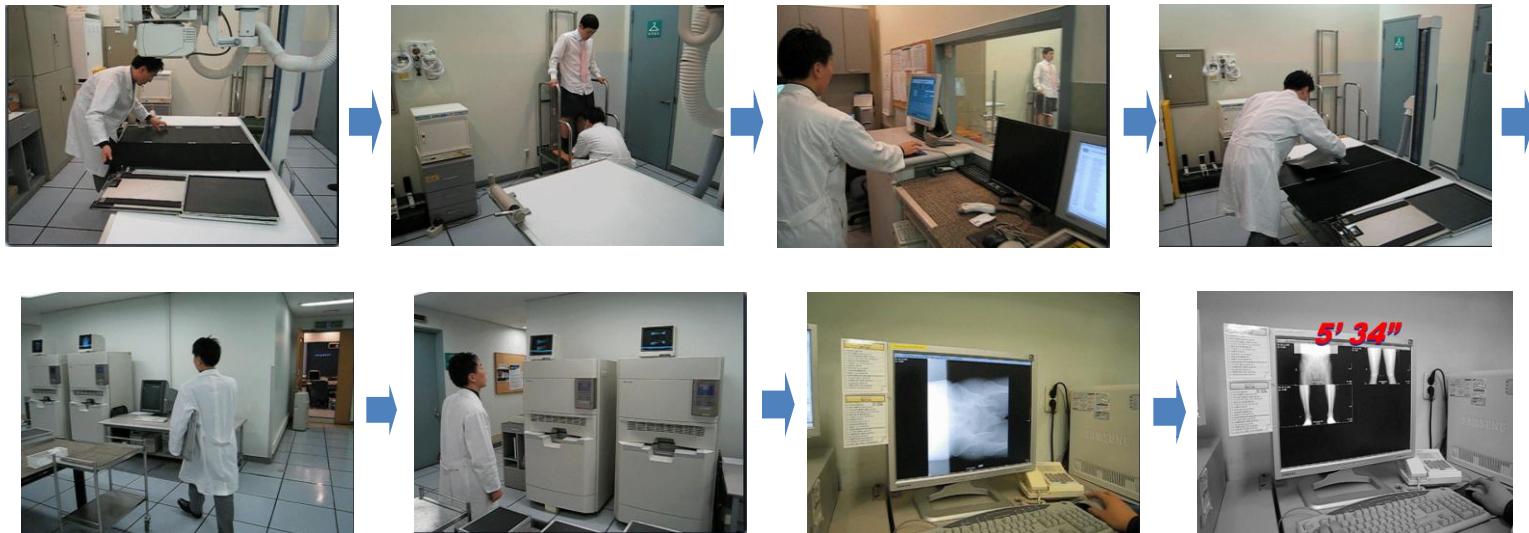
- Presented by Samsung Medical Center



	CR	DDR Inventor-V
Exam. period	July 1,2005~June 30, 2006	July 1,2006~June 30, 2007
long bone	6,262 patients	7,171 patients
whole spine	1,986 patients	2,199 patients

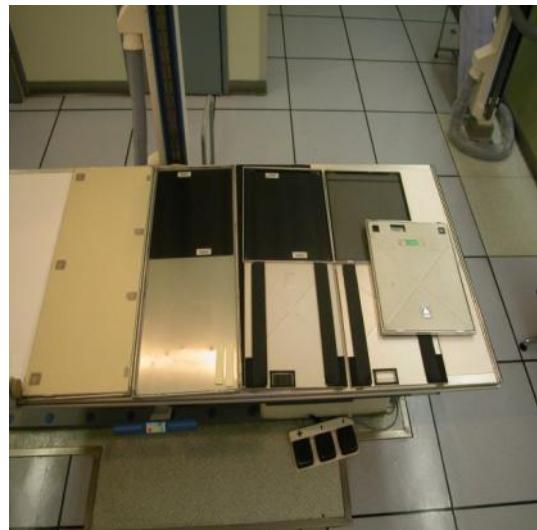
## Procedure for long bone exam. in the CR system

To achieve the image, 3 image plates (size 14" X 17") were inserted in a cassette (size 17" X 43") and exposure one time.



## Procedure for whole spine series exam. in the CR system

To achieve the image, 2 Image plates (size 14" X 17") were inserted in the cassette (size 14" X 36") and exposure one time.



Whole spine series : PA + Lateral

### Procedure for long image exam. in the Scan DR system

To achieve the image, continuous scan (3~5 sec.) is performed.

According to the patients' body length, the tube and detector moved at the same time with fan beam.

DDR Inventor-V



## V. Comparison of working efficiency between CR and JSB Scan DR system

Clinical evidence

► Samsung Medical Center saved **56 + 28 days for a year** with JSB's SCAN DR System

	Examination	CR (05.07.01~06.06.30)	DDR Inventor-V (06.07.01~07.06.30)
Exam. time per patient (sec) [including patient preparation time]	Long bone	334 sec. (5min 34sec)	67 sec. (1min 07sec)
	Whole spine series	510 sec. (8min 30sec)	101 sec. (1min 41sec)
Average exam. time per 1 day (sec)	Long bone	8049.4 (2hour 14min 09sec)	1849.2 (30min 49sec)
	Whole spine series	3876 (1hour 04min 36sec)	858.5 (14min 18sec)
Total exam. time per 1 year (sec)	Long bone	2,091,508 <b>(72days 4hour 58min)</b>	480,457 <b>(16days 5hour 27min)</b>
	Whole spine series	1,012,860 <b>(35days 1hour 21min)</b>	222,099 <b>(7days 5hour 41min)</b>

*< 8 hours / day, 5 days / week, 260 days / year>*

► Comparison of long bone Images

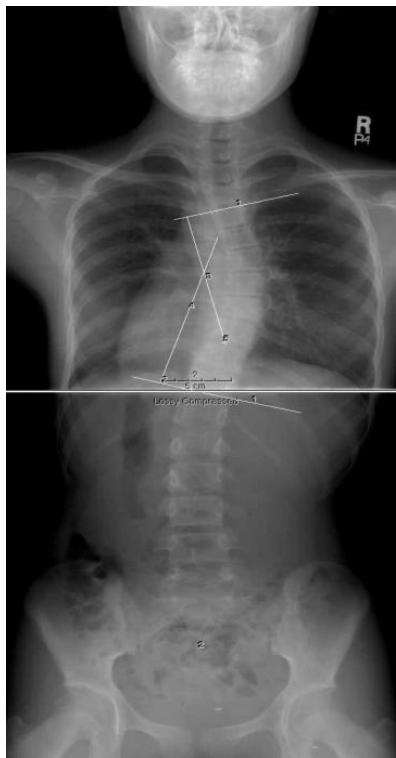


## V. Comparison of working efficiency between CR and JSB Scan DR system

Clinical evidence

### ► Whole Spine PA, Lateral

CR



Discontinuous image,  
Not exact scale

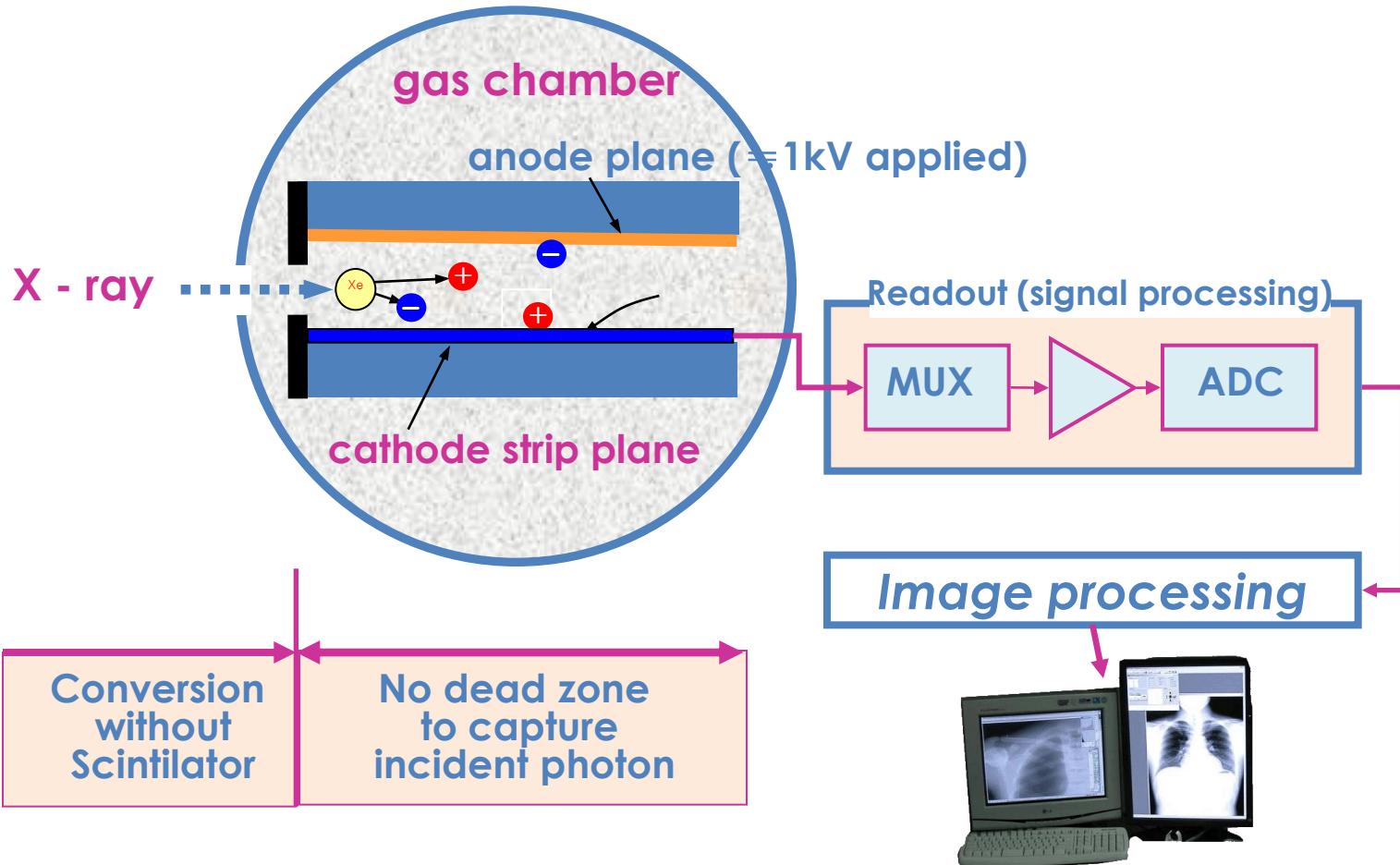
Scan DR



Continuous image

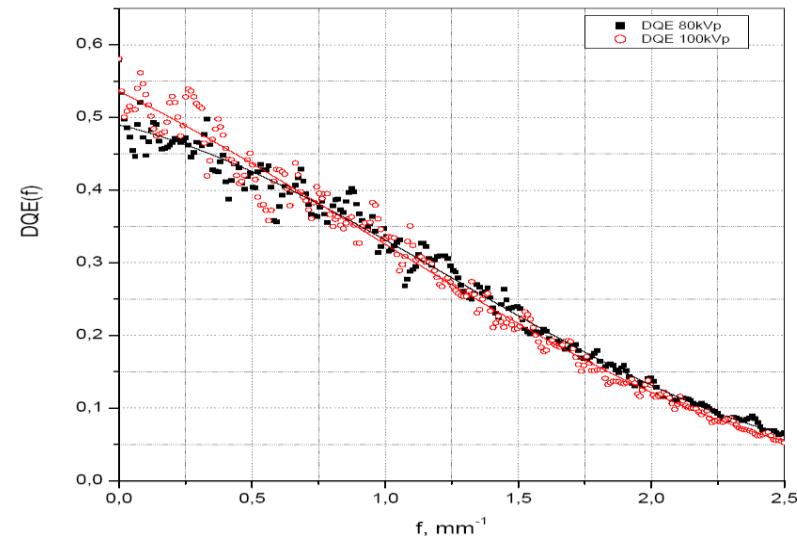
# VI. JSB's Detector and Products

## 1. Action of detector



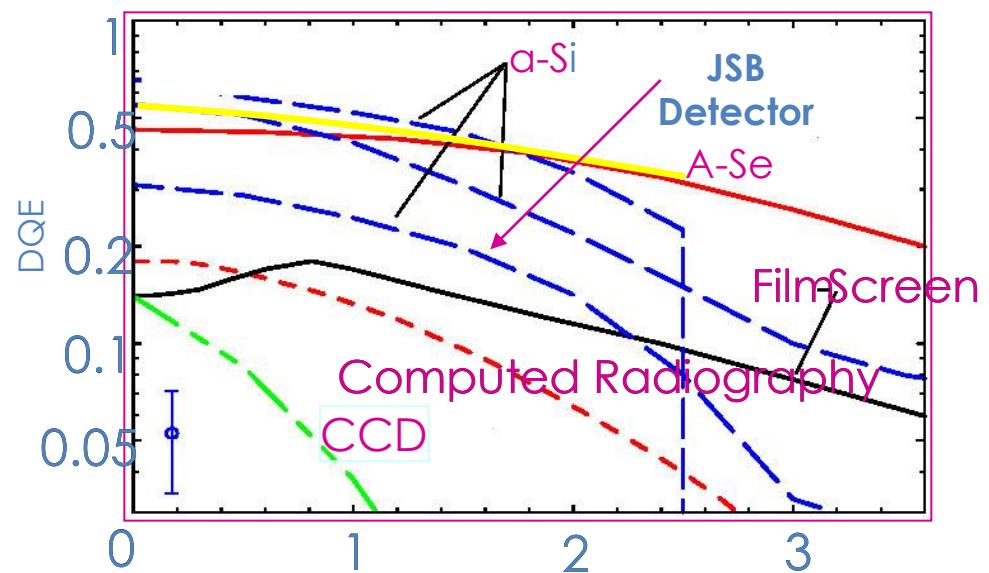
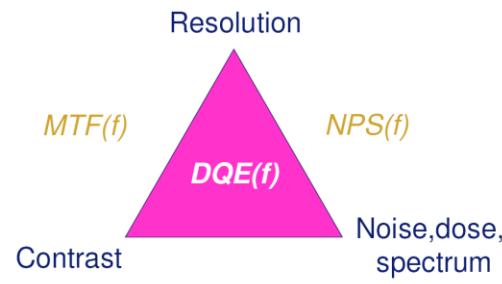
# VI. JSB's Detector and Products

## 2. DQE of JSB detector



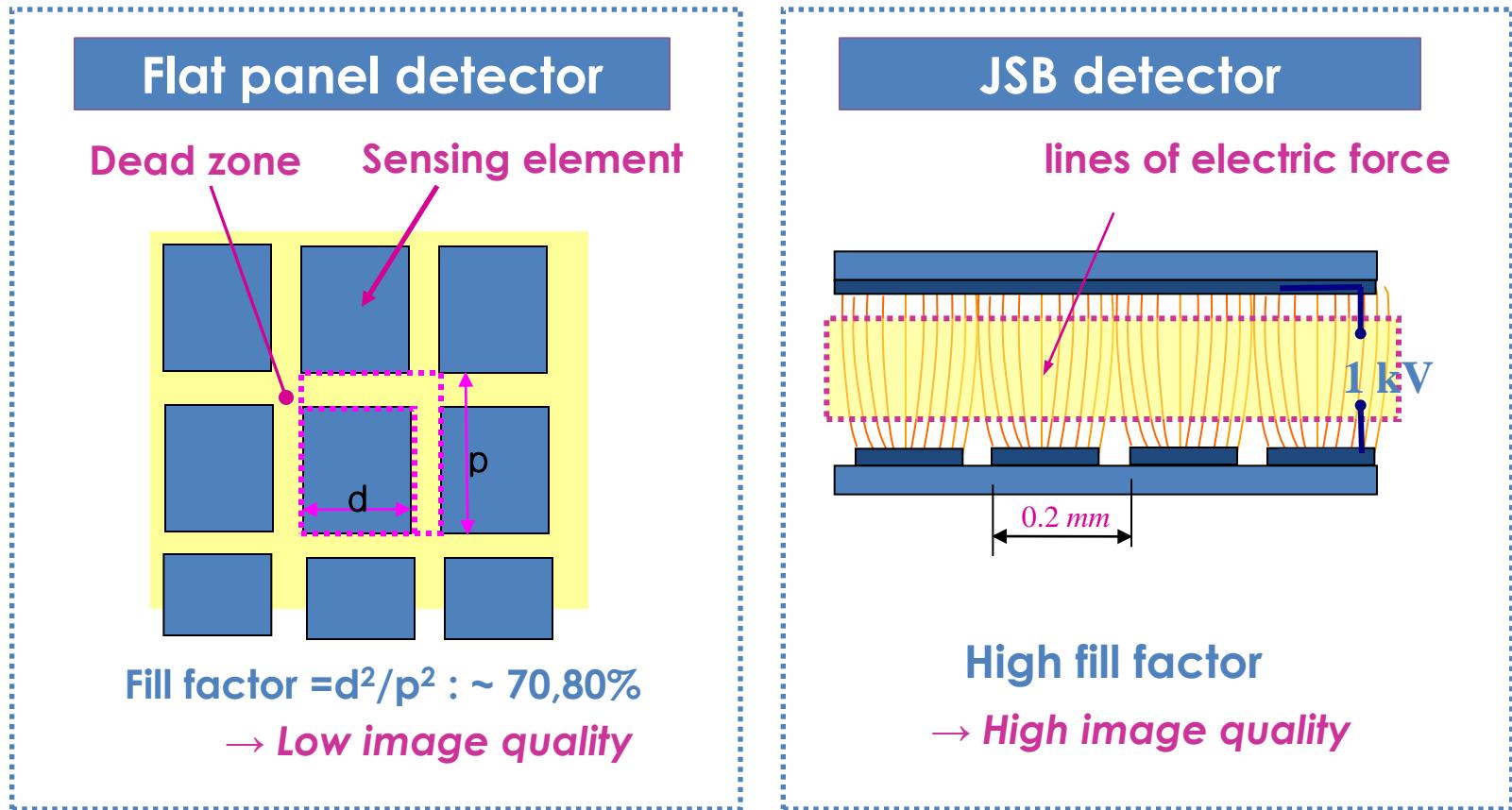
$$DQE = \frac{\text{SNR}^2 \text{ at detector output}}{\text{SNR}^2 \text{ at detector input}}$$

Image Quality Triangle



# VI. JSB's Detector and Products

## 3. No Dead Zone and High Fill Factor

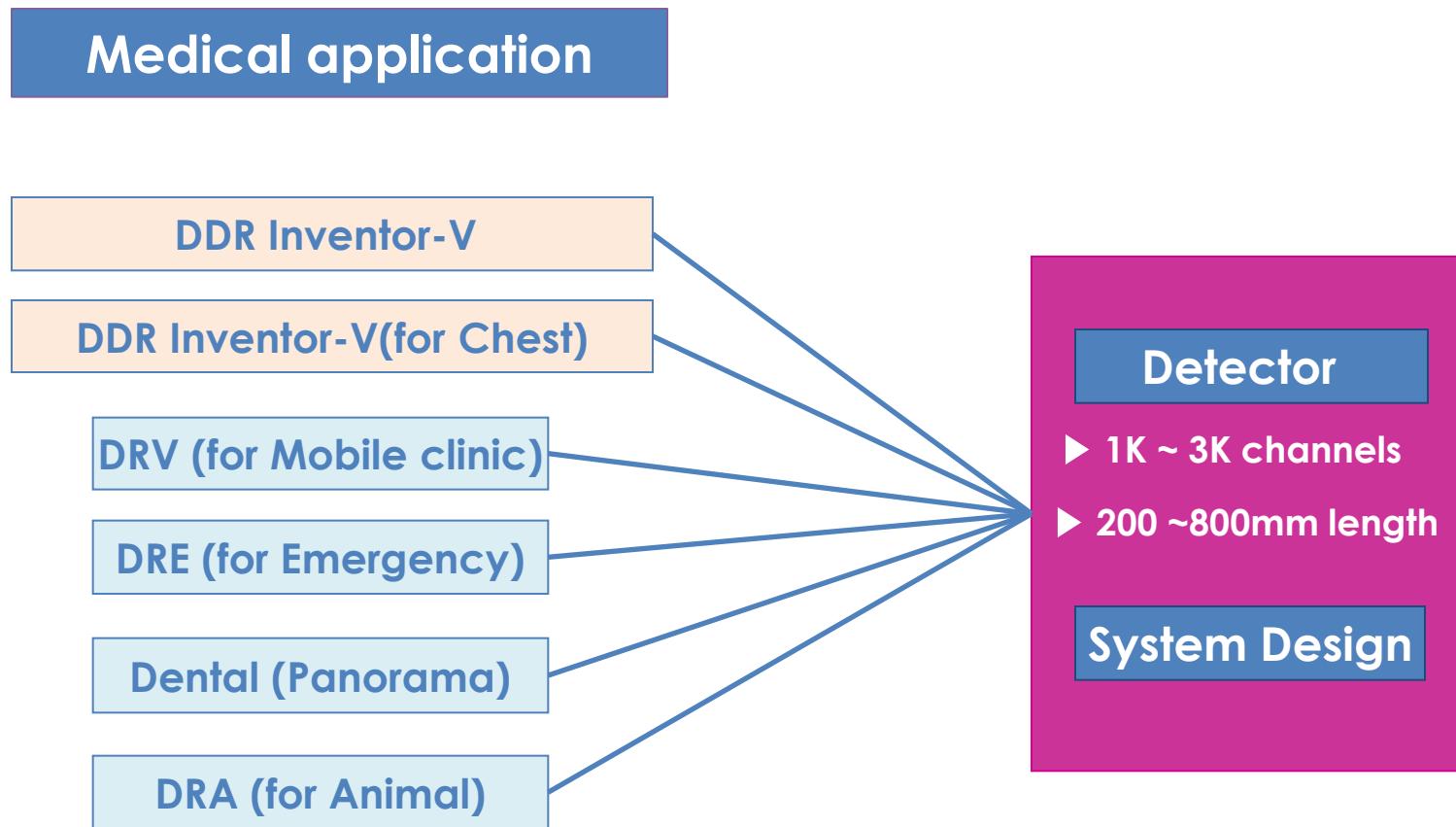


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# VI. JSB's Detector and Products

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## 4. Current products and application area



# VI. JSB's Detector and Products

## 5. Specifications

	DDR Inventor-V (for chest)	DDR Inventor-V
size of image	16"×17"(41×43cm)	16"×39"(41×99cm)
application	chest, skull, abdomen	chest, whole spine, long bone
	image size ≤ 430 mm	image size ≤ 1000 mm
pixel size	200/160/140 $\mu\text{m}$	200/160 $\mu\text{m}$
spatial resolution	2.5 lp/mm	2.5 lp/mm
scan speed	10/14/21 cm/sec.	10/14/21 cm/sec.
scanning time	2 sec.	5 sec.
X-ray tube	150kVp/500mA	150kVp/500mA
Generator	40 kW /1000 mAs	40 kW /1600 mAs
image acquisition time	<1 sec.	< 2 sec.
Gray scale	16384 (14 bit)	16384 (14 bit)



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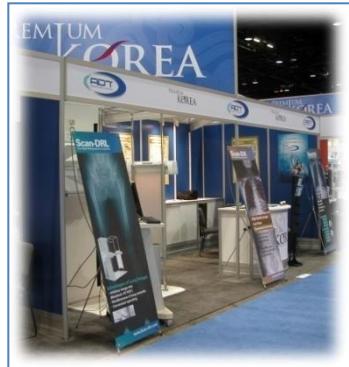
# VI. JSB's Detector and Products

## DDR Inventor-V (Chest)



*DDR Inventor- V enables to get long image like as whole spine and long bone with a shoot.*

**DDR Inventor- V**



**RSNA 2008**



**JSB Medics Co., Ltd.**

# VI. JSB's Detector and Products

## Reference sites



SAMSUNG 삼성서울병원

## Scan-DRM



## DDRIInventor- V



<http://www.krta.or.kr/member/pds/kumsa/sm/htm/main.html>

## VI. JSB's Detector and Products

### Reference sites



### SNU Hospital : DDR Inventor-V (for Chest)

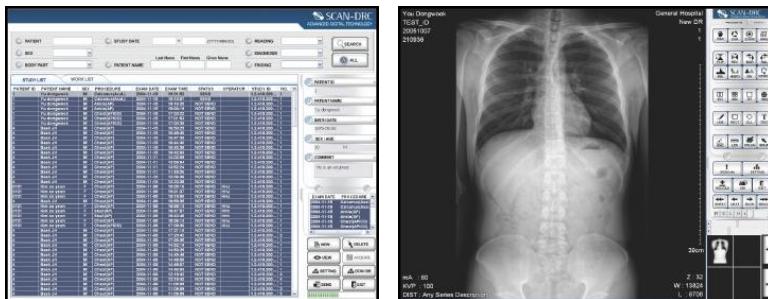


# VI. JSB's Detector and Products - Software

DRWorks-C



DRWorks-M

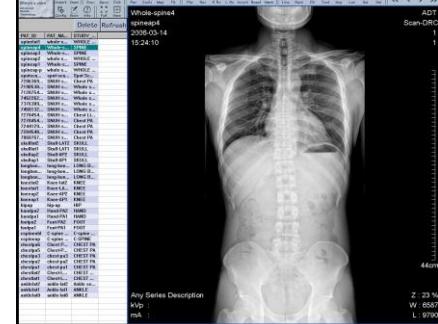


DICOM 3.0  
support

- File creation
- C-store (storage SCU)
- C-find (Worklist management)
- Print SCU
- DIR (make CD)

JSB's software provides mini-PACS for small hospital and elementary image post - processing tool

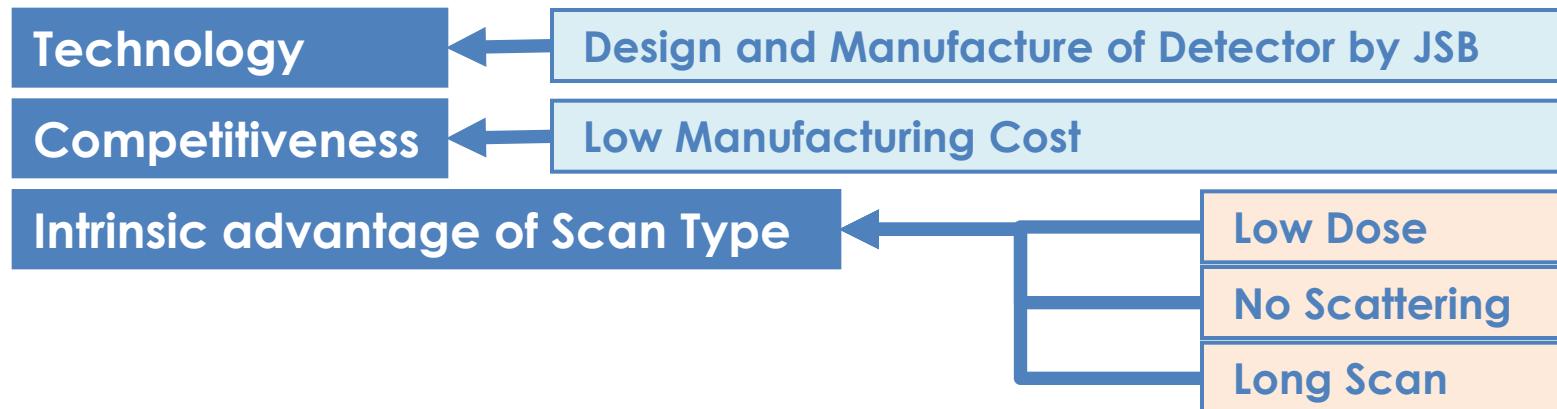
DRVView-Client



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# VII. Comparison of Digital X-ray System

## 1. Why JSB does adapt **SCAN type DR** ?



## 2. Digital X-Ray System Comparison

Manufacturer	JSB	Siemens	Canon	GE	Hologic	Swissary
Model	DDR Inventor-V	Thorax FD	CXDI-22	Revolution	DR-Throax	ddRChest
scintillator / detector	MSGC	Cesium Iodide /a-Si, TFT	Gadolinium Oxysulfide /a-Si, TFT	Cesium Iodide /a-Si, TFT	a-Se /a-Si, TFT	Gadolinium Oxysulfide /lens, CCD
size	41×99 cm	43×43 cm	43×43	41×41	35×43	35×43
pixel (μm)	200	143	160	200	139	169
Spatial resolution	2.5 lp/mm	3.5 lp/mm	3.1	2.5	4.6	3.0

# VII. Comparison of Digital X-ray System

## 3. Manufacturers of Scan type DR

maker	product type	detector	detector supplier
<b>JSB</b>	Chest General purpose Whole body scan	MSGC 200 $\mu\text{m}$ , 140 $\mu\text{m}$	In-house
<b>LODOX</b>	Horizontal scanning model only No chest model	CCD array	In-house assembly
<b>ADANI (Belarus)</b>	Chest General purpose Whole body scan	semiconductor scintillation detector 270 $\mu\text{m}$	In-house assembly
<b>BAMS (China)</b>	Chest General purpose	semiconductor scintillation detector 400 $\mu\text{m}$	In-house assembly
<b>BIOSPACE</b>		Gaseous microstrip detector 254 $\mu\text{m}$	In-house assembly



**ADANI**



**BAMS**



**LODOX**

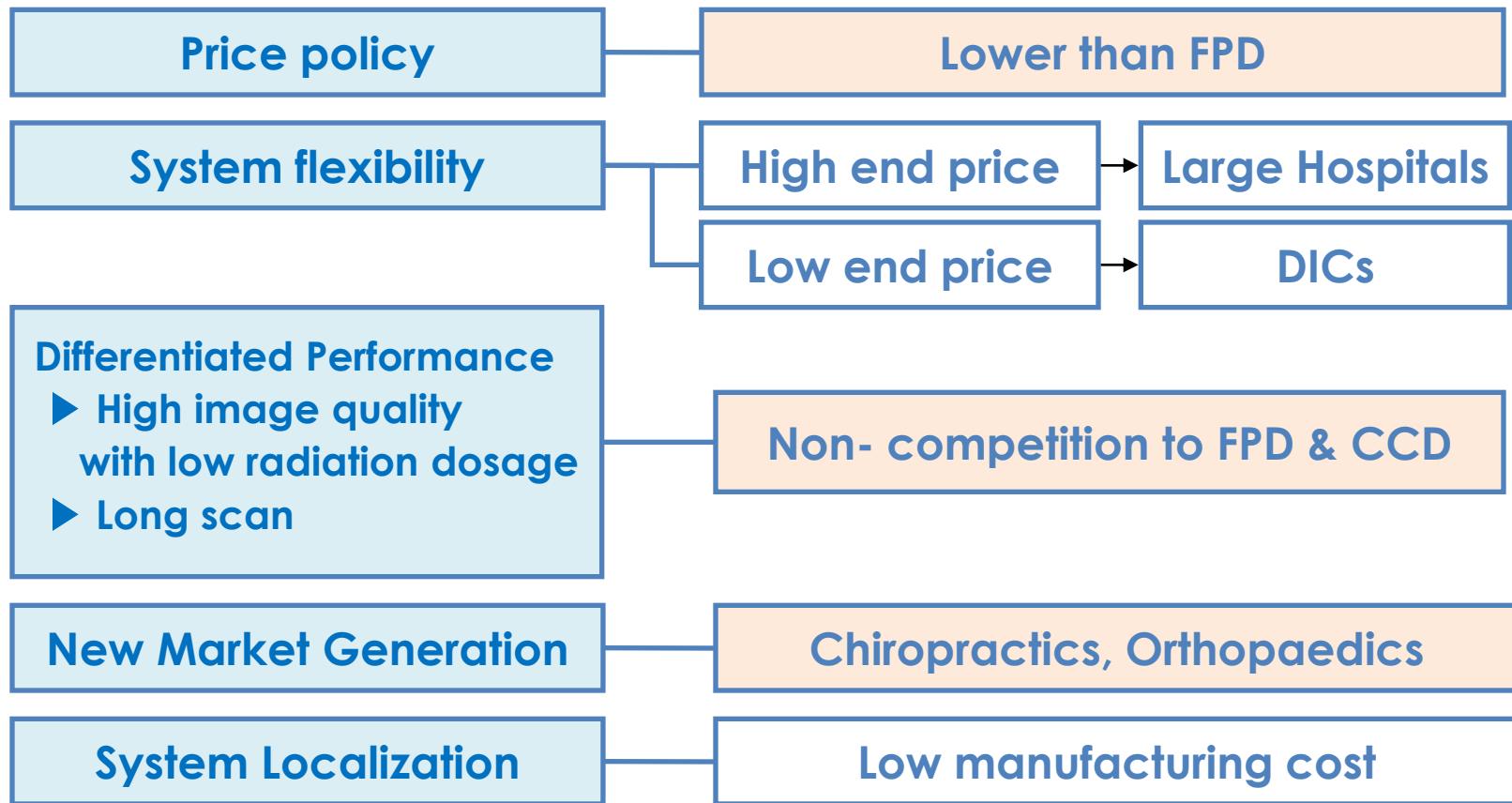


**BIOSPACE**

**BAMS : BEIJING AEROSPACE ZHONGXING MEDICAL SYSTEMS CO.,LTD**

# VIII. Marketing Survey

## Marketing Strategy



# IX. Misunderstanding about Scan type

- 1. Radiation dose is very high...
- 2. Motion blurring...

**Low Dose  
No Blurring**

Scanning time (2.0~3sec.)

?

**Misunderstanding**

Exposure time/line (= 0.7mm/21mm/sec.)

→ equivalent to shutter speed of : 1/300 sec

**Scan speed of SCAN DR : 10,14,21cm/sec exposure time /line = 0.0035 sec.**

**cf> exposure time of film screen or FPD or CCD = 0.01 ~ 0.1 sec.**

Effect of Heart beating...

**No Problem**

Max. human muscle speed : ~7cm/sec.

**Motion blurring can not be seen because relative speed between adjacent muscle or organs is very low**

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# THANK YOU



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